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GB 1176704 US 4342500

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H1A
G2J
Selected US specifications from IPC sub-class G02B

(54) Telecommunication cable

(57) A cable has two layers 7*a*, 10*a* of oppositely wound steel armour wires and a compressible material 8*a* located between the armour wires. The layer of compressible material allows the armour wires to move into it and thereby permit the cable to be coiled to a predetermined minimum coiling diameter as required (Fig. 1*b*). The compressible layer may be provided by a layer of foam tape (Fig. 2) or the wires of one or both layers of armour have a foam coating (Figs. 3 & 4). Alternatively the compressible layer may be formed *in situ* by solidifying a liquid silicone rubber. The embodiment shown is an optical cable with a strain member 3 & plastic sheathed optical fibres 2. The cable also comprises a foam tape 11, a polythene bedding layer 12, a jute covering 13, steel wires 15 and polypropylene roving 16.

Fig. 1a.

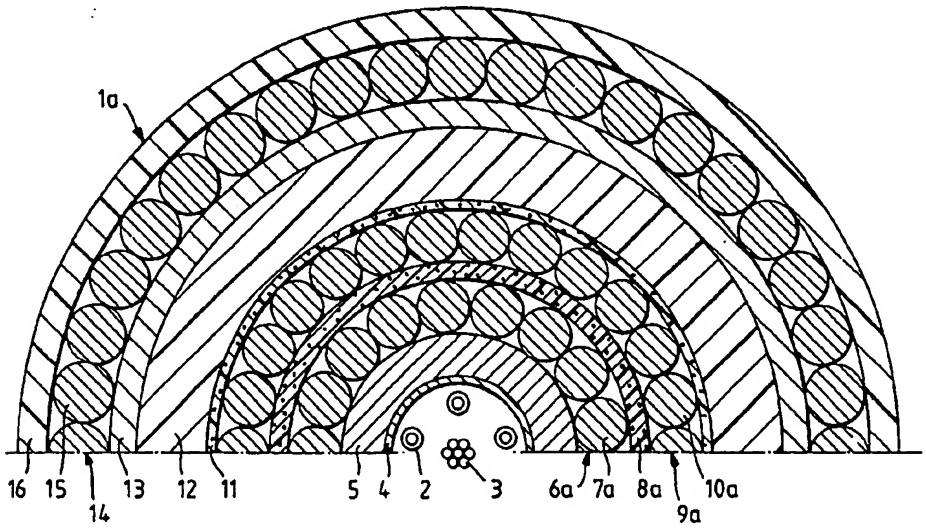

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Fig. 1a.

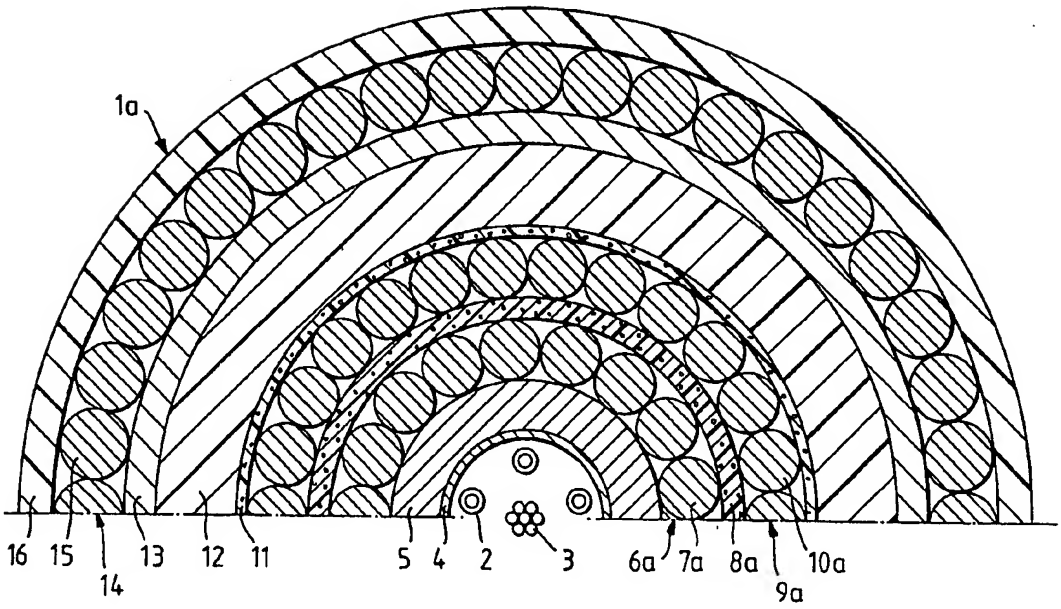

1a
16
15
14
13
12
11
5
4
2
3
6a
7a
8a
9a
10a

Fig. 1b.

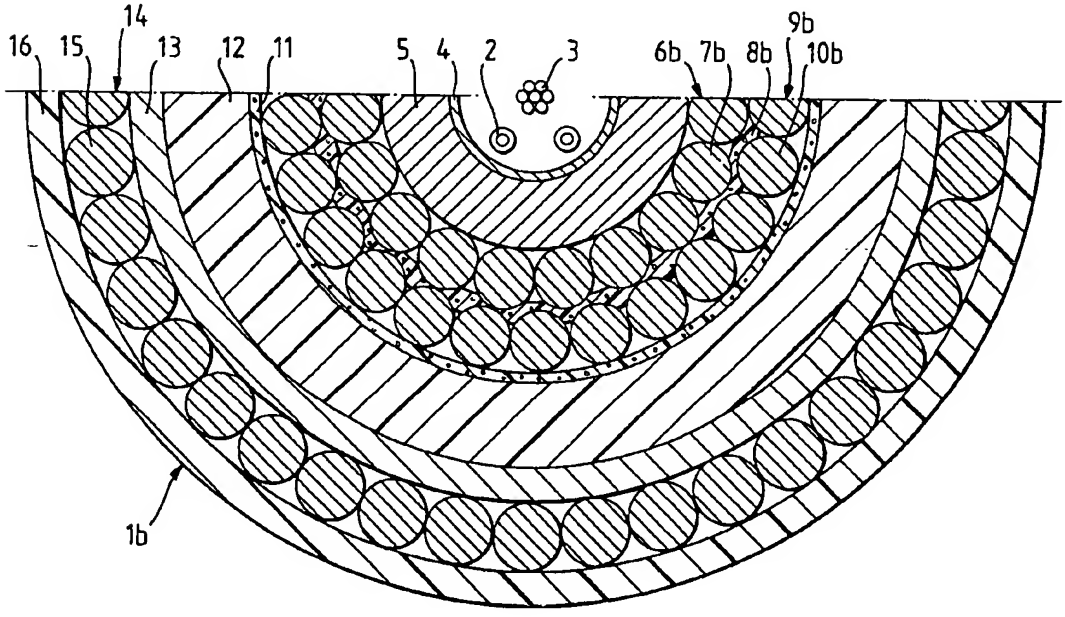

16
15
14
13
12
11
5
4
2
3
6b
7b
8b
9b
10b
1b

Fig.2.

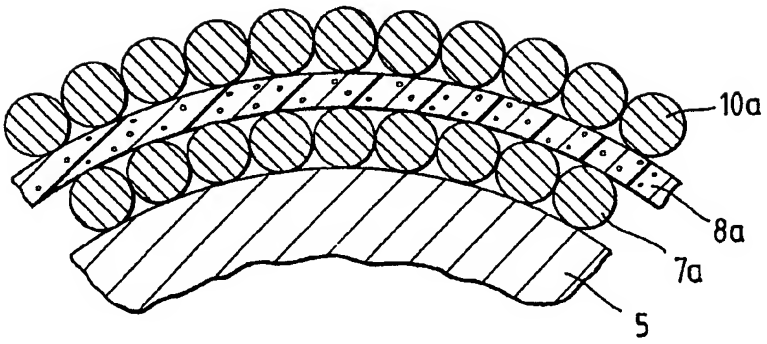


Fig.3.

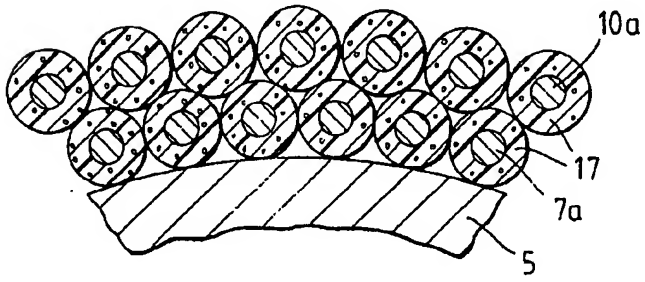
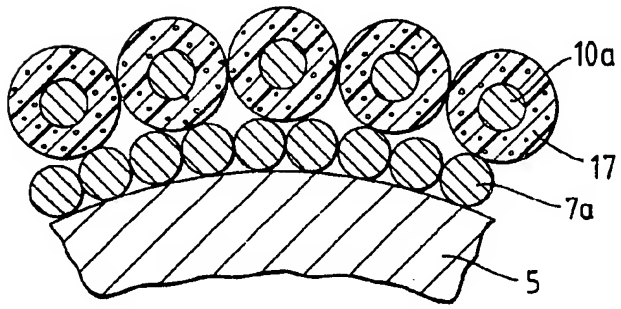


Fig.4.



SPECIFICATION

Optical/electrical/composite cable

This invention relates to an armoured cable, more specifically to a submarine telecommunications cable surrounded by inner and outer layers of oppositely wound armour wires.

The cable could be an optical/electrical/-composite cable containing either optical fibres, electrical conductors or a combination of the two.

Broadly there are two desirable objections that certain types of optical/electrical/composite cables should aim to satisfy. Firstly the cable should have a construction such that whilst the cable is under strain the layers of armour act so as to prevent excessive rotation of the cable, and secondly it must be possible to coil the cable to a predetermined minimum coiling diameter. The first of these aims is satisfied by a cable having two adjacent layers of oppositely wound armour wires, as when such a cable is under tension the oppositely wound inner and outer armour layers act to oppose rotation of the cable. However when an attempt is made to coil such a cable the inherent rotation which is produced on coiling tends to introduce an extra twist in the outer armour layer, thereby reducing its pitch circle diameter, and/or reduce some of the twist in the inner armour layer, thereby increasing its pitch circle diameter. The result is that the cable has a very strong resistance to coiling. Hence the problem of overcoming the disadvantages of the prior art lies in retaining the property of opposing cable rotation whilst under tension, but allowing the cable to be more readily coiled.

According to the present invention a cable comprises a core, which contains one or more conducting members, which is surrounded by inner and outer layers of oppositely wound armour wires and a compressible material located between said layers of amour wires.

The conducting members may be either electrical conductors or optical fibres or a combination of the two.

By including a compressible material between the inner and outer layers of armour wires it is possible for these layers to move into the compressible material to some degree during the twist produced by coiling. The thickness of the compressible material is preferably chosen so as to permit the cable to be coiled in a predetermined minimum coiling diameter. The compressible material may consist of a foam tape, although other forms of compressible layers can be used in accordance with the invention. Either the inner or outer armour wires or both inner and outer armour wires may be surrounded by a compressible coating such as a foam.

The compressible material may be introduced into the region between the layers of armour wires so as to fill the region completely; it is preferably applied in fluid form and then allowed to solidify. A silicone rubber compound may be used for this purpose.

The invention will now be described, by way of example only, with reference to the drawings in which:–

Figure 1 shows a cross-section through the cable when it is (a) uncoiled, and (b) coiled, and,

Figures 2, 3 and 4 show three constructions, in accordance with the invention, of the inner and outer armour layers.

Referring now to Fig. 1a, this represents a half section of an uncoiled submarine telecommunication cable 1 having one or more plastics sheathed optical fibres 2 loosely stranded together with a central strain member 3 and bound with a paper tape 4, surrounded by a lead sheath 5. An inner armour layer 6a, comprising one or more helically stranded steel wires 7a, surrounds and is supported by the lead sheath 5 and is separated from a surrounding outer armour layer 9a, similarly comprising one or more helically stranded steel wires 10a but wound in the opposite direction to the wires 7a, by a first compressible foam tape 8a. The outer armour layer 9a is surrounded by a polythene bedding sheath 12 which is interiorly lined with a second foam tale 11. The bedding sheath 12 has an outer fibrous covering 13, such as jute or the like, which supports a reinforcing layer 14 comprised of one or more helical steel wires 15 wound in broadly the same direction (although not necessarily parallel) to the inner armour wires 7a. Finally the cable 1 has, fastened around the reinforcing layer 14, an exterior covering 16 which comprises a polypropylene roving or the like.

Referring now to Fig. 1b this represents a half-section of a coiled submarine cable 1b (which in its uncoiled form was described above with reference to Fig. 1a). As the cable 1b is coiled, rotation of the cable is produced which introduces extra twist into the outer armour layer 9b, thereby reducing its pitch circle diameter, and/or removes some twist from the inner armour layer 6b, thereby increasing its pitch circle diameter, the effect of this being to compress the first foam tape 8b. In the illustration the cable 1a is shown coiled to almost its minimum coiling diameter. When the cable is coiled to its minimum coiling diameter the layer foam layer 8b will be compressed to its minimum thickness. allowing no further movement of the wires 7b and 9b.

Referring now to Figs. 2, 3, and 4 which show three examples, in accordance with the present invention, of providing a compressible layer separating inner and outer armour wires.

Fig. 2 represents the example as described above with reference to Fig. 1a, utilising a separate layer of compressible foam, for

example in the form of a tape.

Fig. 3 shows inner and outer armour wires, 7a and 10a respectively, each being coated with a compressible material 17 such as a foam.

Fig. 4 shows only the outer armour wires 10a being coated with a material 17, although it is of course appreciated that having only the inner armour wires 7a coated with the said material 17 would also be in accordance with the invention.

CLAIMS

1. A cable, comprising a core containing at last one conducting member which is surrounded by inner and outer layers of oppositely wound armour wires and a compressible material located between said layers of armour wires.

2. A cable as claimed in Claim 1 wherein at least one of said conducting members is an optical fibre.

3. A cable as claimed in Claim 1 wherein at least one of said conducting members is an electrical conductor.

4. A cable as claimed in Claim 1 wherein the core contains at least one optical fibre and at least one electrical conductor.

5. A cable as claimed in any preceding claim wherein said compressible material is a foam tape.

6. A cable as claimed in any preceding claim wherein said inner armour wires are each surrounded by a compressible coating.

7. A cable as claimed in any preceding claim wherein said compressible material completely fills the region between said layers of armour wires.

8. A cable as claimed in Claim 6 wherein said compressible material is applied to said region in fluid form and then allowed to solidify.

9. A cable as claimed in Claim 7 wherein said compressible material is a silicone rubber compound.

10. A cable as claimed in any preceding claim wherein said outer armour wires are each surrounded by a compressible coating.

11. A cable as claimed in Claim 6, 7, 8 or 10 wherein said compressible coating is a foamed material.

12. A cable substantially as shown in and as hereinbefore described with reference to Fig. 1a, 1b and 2 or Fig. 3 or Fig. 4 of the accompanying drawing.

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